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LXXVIII. *A Proposal for discovering the Annual Parallax of Sirius ; by the Rev. Nevil Maskelyne, A. M. Fellow of Trinity College, Cambridge, and F. R. S.*

Read June 26, 1760. **T**HE Royal Society having come to a resolution to send persons of ability to proper places, in order to observe the approaching passage of Venus over the Sun, the 6th of June next year ; (which phænomenon was first proposed to this Society, by the late excellent Dr. Halley, forty-four years ago, as a proper means of determining the Sun's parallax, to a great degree of exactness) I take this opportunity of recommending to the consideration of this learned body another very important object in astronomy, which, I apprehend, may be cleared up at the same time, by the astronomers sent to one of those places, which will probably be judged convenient for the observation of Venus's transit ; I mean the island of St. Helena.

The astronomical object, in favour of which I desire to engage your attention, is no less than the determination of the annual parallax of the Orbis Magnus ; the finding out of which, from observation, would be the fullest and directest proof of the Copernican system, as the want of this proof, hitherto, has been the strongest argument made use of by those, who have withheld their assent to an hypothesis, which so fully, and yet simply, satisfies all the other phænomena.

No

No one, indeed, at this time of day, will venture to assert, that, even if no annual parallax could be found, after the greatest exertion of human art and industry, the Copernican system was not, therefore, true; since the quantity of this parallax may be so small, as to escape the reach of our sight, though assisted to the utmost. But though the defect of it would be no just argument against the Copernican system, yet the actual demonstration of it, from observation, would be a direct and convincing proof of the truth of that system.

It remains then to be considered, what hope there is now left, after astronomy has been brought to such a great degree of perfection, of being able to find out an annual parallax in any of the fixed stars.

I am sensible I may here seem to be presumptuous, in venturing to treat upon this subject, after the many accurate observations made by the learned Dr. Bradley, with an instrument constructed for this very purpose. No one can have a higher veneration than I have for the discernment and exactness of this illustrious astronomer, whose merit I have the greater opportunity of being acquainted with, by having the honour of calling him my friend. I would just beg leave to take notice, that the stars, which this astronomer observed, were such only as lay within a few degrees of his zenith: and though his observations do not seem to shew a sensible parallax in any of them, yet we cannot thence absolutely conclude, that, amongst the great number of visible stars, there are none in which it may be perceptible, till they have all of them, especially those of the greatest lustre, been observed in proper places, near the zenith, with the
like

like care and accuracy, which he has used : for, as Dr. Bradley has himself remarked, where any stars are remote from the zenith, the uncertainties of refraction, and the irregular motions of the air, become so great, as to take away from us all hopes of observing them to an equal degree of exactness.

The particular star, which, I propose, should be carefully observed, with a view of discovering its annual parallax, if sensible, is Sirius, the brightest of all the stars in the firmament, and which is therefore, probably, the nearest to us of them all. With us, this star passes the meridian, at the altitude of 22° , where the refractions are too irregular to admit of our discovering a very minute quantity, by observation : but, at the island of St. Helena, Sirius passes only half a degree south of the zenith ; and, on this account, I have, for some time, looked upon that as the most proper place to make observations at, for this purpose.

I shall now beg leave, with great deference, to lay before you a particular argument, which has, for these two years, induced me to think it probable, that the annual parallax of Sirius is not so small, as to elude the nice discernment of our modern astronomers ; and shall be glad to be determined by your opinion, whether it affords a sufficient presumption to us, to undertake a careful and assiduous series of observations of the distances of Sirius, from the zenith of the island of St. Helena. This argument is drawn from an examination, which I have made, of the observations of the zenith distances of Sirius, taken at the cape of Good Hope, in the years 1751 and 1752, by that excellent astronomer, and diligent

observer, the Abbé de la Caille, recited in his *Fundamenta Astronomiæ*, printed about two years since, wherein also are contained all the observations, which he has taken of the principal fixed stars; a work truly worthy of its name! Every particular observation of the same star is reduced to one epoch, that of the beginning of the year 1750, by applying the equations of aberration, precession, and deviation, to the observed places; so that the places corrected ought all to agree together, if the observations were perfectly exact, and the star was affected with no sensible motion, that was unaccounted for. Being satisfied with the excellence of the observations, I was tempted to examine those of some of the principal fixed stars, in hopes of discovering some sensible differences in the observations made at different times of the year, when a parallax, if there had been any, would have had the greatest effect. But I found very few stars, the observations of which were sufficient in number, or taken at proper seasons of the year, to give room for any inference at all. Fortunately, however, the observations of the zenith distances of Sirius were more in number, and, what is still of more consequence, in this case, made in various, and some in opposite seasons of the year: and, upon looking them over, I was agreeably surprized to find a very sensible difference in the observations made at different times, agreeing in direction with what a parallax ought to produce, the zenith distance of Sirius in July coming out no less than 8" greater than in the opposite season of the year, namely in December and January: the zenith distance also in March and April

April being of an intermediate quantity, as it ought to be: for, Sirius being in conjunction with the Sun in June and July, it is evident he must be then farther from the Earth than in December and January, when he is in opposition to the Sun, and, consequently, his latitude and declination, which are both south, must be less in the former case, than in the latter; and therefore, as he passes north of the zenith at the cape of Good Hope, his zenith distance must be greater in the former season, than in the latter, as the observations indicate: but, in March and April, when Sirius is in quadrature with the Sun, and equally distant from the Sun and Earth, his apparent latitude and zenith distance must be the same as the true, or that which would obtain, if the Earth was translated to the Sun, and consequently, a mean between the zenith distances in July and December, agreeably to the observations.

I shall now lay before you the observations themselves, together with the calculations, which I have made of the values of the parallax for each, the maximum being assumed 9", which I find will best reconcile the observations with one another.

		Zenith distance of Sirius at Cape, observed and re- duced.		Annual parallax to reduce observat. to mean.	Zenith distance corrected for an- nual parallax.	Difference between each observation cor- rected, and the mean of the distances cor- rected.	
		°	'	''	''		
1751.	July 12.	17	31	19.1	— 4.3	17 31	14.8 — 1.1
	July 13.	17	31	19.3	— 4.3	17 31	15.0 — 0.9
	July 14.			21.7	— 4.3		17.4 + 1.5
	July 15.			19.7	— 4.3		15.4 — 0.5
	July 16.			19.0	— 4.3		14.7 — 1.2
1752.	April 5.			16.7	— 1.0		15.7 — 0.2
	April 3.			15.7	— 0.8		14.9 — 1.0
	March 28.			14.0	— 0.4		13.6 — 2.3
	March 14.			13.1	+ 0.7		13.8 — 2.1
	March 8.			15.2	+ 1.2		16.4 + 0.5
	March 5.			18.8	+ 1.4		20.2 + 4.3
	March 4.			17.3	+ 1.5		18.8 + 2.9
	March 1.			15.9	+ 1.6		17.5 + 1.6
	Feb. 17.			12.8	+ 2.6		15.4 — 0.5
	Jan. 21.			11.1	+ 4.0		15.1 — 0.8
1751.	Dec. 31.			11.6	+ 4.5		16.1 + 0.2

Mean of zenith distances corrected }
for parallax - - - - - } 17 31 15.9

The first column shews the year and day of the observations; the second the zenith distances of Sirius at the cape of Good Hope, as delivered in Abbé de la Caille's recital; the third contains the computed values of the parallax at different times, taking that of the maximum 9"; the fourth column gives observations reduced to the mean, by applying the parallax computed in the third column to the observations in the second; which quantities ought all to agree together, if the observations were liable to no error, and the parallax was rightly assumed: but, taking a mean of them all, the last column shews how much each of them differs from that mean,

mean, which, in general, is very small, and scarce exceeds 2", except in two observations, in one of which it amounts to 3", and the other to 4": but these differ as much from the mean of the six other observations made at the same season of the year. Thus, assuming a parallax, the observations will be found to agree as well with that supposition, as they do with one another. But if the observations are considered in themselves, without any allowance for parallax, they will differ sensibly from one another: nor is this difference to be found only in two observations, in which case, it may easily be attributed to the account of the unavoidable errors; but five observations in July opposed to two in December and January, make the zenith distances vary 8" in the direction, which a parallax ought to produce.

I am aware, that it may be objected, that two observations made in the winter season in December and January, at one of the maxima of the parallax, are too few to determine a point of such consequence, and readily agree, that the argument is weakened in proportion to the paucity of the observations: but then, it should also be considered, that the observations made in March and April concur with the rest in supporting the supposition of a parallax; and, upon the whole, the observations will, perhaps, be judged to afford a sufficient presumption of the existence of a parallax, to encourage the undertaking a careful trial. It is upon the strength of this presumption, principally, that I have ventured to lay these thoughts before the Royal Society, whose members may justly claim the honour of having made the greatest attempts towards demonstrating this important, but yet undetermined point in astronomy.